SYSTEMS AND METHODS FOR PLAYBACK DEVICE MANAGEMENT

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] The current application claims the benefit of and priority under 35 U.S.C. § 119(e) to U.S. Provisional Patent Application No. 62/907,367 entitled "Systems and Methods for Device Localization and Prediction" filed Sep. 27, 2019. The disclosure of U.S. Provisional Patent Application No. 62/907,367 is hereby incorporated by reference in its entirety for all purposes.

TECHNICAL FIELD

[0002] The present technology relates to consumer goods and, more particularly, to methods, systems, products, features, services, and other elements directed to management of playback devices in media playback systems or some aspect thereof.

BACKGROUND

[0003] Options for accessing and listening to digital audio in an out-loud setting were limited until in 2003, when SONOS, Inc. filed for one of its first patent applications, entitled "Method for Synchronizing Audio Playback between Multiple Networked Devices," and began offering a media playback system for sale in 2005. The SONOS Wireless HiFi System enables people to experience music from many sources via one or more networked playback devices. Through a software control application installed on a smartphone, tablet, or computer, one can play what he or she wants in any room that has a networked playback device. Additionally, using a controller, for example, different songs can be streamed to each room that has a playback device, rooms can be grouped together for synchronous playback, or the same song can be heard in all rooms synchronously. Given the ever-growing interest in digital media, there continues to be a need to develop consumer-accessible technologies to further enhance the listening experience.

SUMMARY

[0004] Systems and methods for managing playback devices in accordance with embodiments of the invention are illustrated. One embodiment includes a method for modifying a system that includes several devices. The method includes steps for measuring a first signal pattern for wireless signals between the several devices, measuring a second signal pattern for the wireless signals after measuring the first signal pattern between the several devices, determining an updated state of the system based on a difference between the second signal pattern and the first signal pattern, and modifying state variables of one or more devices of the playback system based on the determined updated state.

[0005] In a further embodiment, the first signal pattern is a baseline signal pattern for a space between the several devices, where the baseline signal pattern includes a signal pattern measured at a particular time of day.

[0006] In still another embodiment, determining an updated state of the system includes estimating positions of a set of one or more individuals in a space between the several devices based on the difference between the second signal pattern and the first signal pattern, and modifying the state variables of the devices of the system is based on the estimated positions of the set of individuals in the space.

[0007] In a still further embodiment, the method further includes steps for learning location information for signal patterns, wherein estimating positions of the set of individuals in the space is based on the learned location information.

[0008] In yet another embodiment, learning location information for signal patterns comprises measuring several signal patterns of the space at multiple time instances, localizing an individual in the space at each time instance, and associating a location of the individual with the corresponding signal pattern, wherein estimating the positions of the set of individuals comprises matching the second signal pattern to a particular signal pattern of the several signal patterns, and estimating a location for the set of individuals based on at least one associated location for the particular signal pattern.

[0009] In a yet further embodiment, localizing an individual includes localizing a portable device associated with the individual.

[0010] In another additional embodiment, localizing an individual includes receiving input from the individual that indicates a location of the individual within the space.

[0011] One embodiment includes a non-transitory machine readable medium containing processor instructions for managing a system includes several devices, where execution of the instructions by a processor causes the processor to perform a process comprising receiving information indicative of a first signal pattern for wireless signals between the several devices, receiving information indicative of a second signal pattern for the wireless signals between the several devices, determining an updated state of the system based on a difference between the second signal pattern and the first signal pattern, and modifying state variables of one or more devices of the system based on the determined updated state.

[0012] In a further additional embodiment, the method further includes steps for monitoring motion in a space between the several devices, wherein the first signal pattern is measured when there is no motion measured in the space.

[0013] In another embodiment again, modifying the system includes modifying a set of one or more parameters for audio content provided at the several devices, wherein the set of parameters includes at least one of the group consisting of equalizer settings, volume, bass, treble, balance, and fade.

[0014] In a further embodiment again, the first signal pattern is a baseline signal pattern for a space between the several devices, wherein the method further includes periodically updating the baseline pattern.

[0015] In still yet another embodiment, updating the baseline pattern includes computing an average pattern from signal strengths measured at various times of day.

[0016] In a still yet further embodiment, updating the baseline pattern comprises detecting a lack of activity in the system, measuring a third pattern of wireless signals between the several devices, and updating the baseline pattern with the third pattern.

[0017] In still another additional embodiment, the several devices include a center speaker device, a right speaker device, and a left speaker device.

[0018] One embodiment includes a device of a playback system that includes several devices, the device comprising a network interface, a set of one or more processors, and a